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CARPENTER & KULAS, LLP 1900 EMBARCADERO ROAD SUITE 109 PALO ALTO, CA 94303			FLOURNOY, HORACE L	
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			2189	

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/628,036

**Applicant(s)**

RAMCHANDRAN, AMIT

**Examiner**

Horace L. Flournoy

**Art Unit**

2189

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7/24/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

Claims 1-20 are presented for examination.

#### ***Priority***

Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged. However, the provisional application upon which priority is claimed fails to provide adequate support under 35 U.S.C. 112 for claims 1-20 of this application. The specification of the provisional application does not appear to provide support for the claimed subject matter.

#### ***Drawings***

The drawings are objected to because "ACM" is not disclosed in the specification. The specification discloses "ACE" (adaptive computing engine). The examiner is not sure if "ACM" from the drawings is a typographical error.

Also, the drawings do not show the function of transposing the matrix as claimed in claims 12 and 20.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate

Art Unit: 2189

prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

1. The **drawings** of the disclosure are objected to as stated supra.
2. The disclosure is objected to because of the following informalities: Under the section entitled "CROSS-REFERENCES TO RELATED APPLICATIONS" the serial numbers each listed application must be included. Note that it is unclear whether these are to be incorporated by reference. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 101***

Art Unit: 2189

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 5, 13, and 20 rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility. The examiner interprets "without latency" or "without any latency" to mean without the expiration of time. It seems impossible to create an apparatus that retrieves a plurality of data values from the memory unit and communicates the plurality of data values to the plurality of data buses without any latency. Similarly, it seems impossible to each cache port to receive a data value from a different one of the plurality of data buses without any latency. There must be some amount of time required to perform these functions.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 5, 6, 13, 15, 16, and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. With respect to phrases "without latency", "without any latency

Art Unit: 2189

due to registering", "without any latency", and "without any register latency", this subject matter found in claims 5, 6, 13, 15, 16, and 20 (non-respectively), is not enabled in the specification, as one of ordinary skill in the art would not know how to make and/or use an invention that moves data without any latency, without undue experimentation.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "without latency" in claim 5 is a relative term which renders the claim indefinite. The term "without latency" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The examiner cannot determine from the claim or the specification what is being done "without latency." There is no definitive verb in this claim, which points out what is being done "without latency."

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8, 10, and 12-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Wilson (U.S. Patent no. 5,557,734, hereafter referred to as Wilson).

With respect to independent claim 1, "A distributed data cache as memory or register file comprising: a first cache memory unit having a plurality of cache ports; and a plurality of data buses connected with the cache memory unit, wherein each of the plurality of data buses is connected with the plurality of cache ports of the cache memory unit." is disclosed in column 11, lines 39-47, FIG. 5.

The examiner interprets this limitation as a distributed data cache that is functioning as memory or register file while comprising a multiplicity of ports on the cache or memory unit. (Note: Both the drawings and the specification of this application do not disclose the explicit use of a cache port, only a connection between an individual cache memory and the data bus(es) ). Wilson teaches "Referring to FIG. 5, a single

Art Unit: 2189

processing unit 29 of block 28 is shown wherein data flows along lines therein depicted in directions indicated by arrows... a plurality of cache memories MEM0-MEM8, a plurality of selectors S10-S28, S30-34, and S56, a second cross bar switch 51, a pair of cross bar connecting lines 52 and 53, a transpose in bus 54, a transpose out bus 55, a selector output line 57, a tristate gate 58 and a cache output line 59" (column 11, lines 37-47).

Wilson teaches multiple (input/output) connections for data flow into each cache memory unit (plurality of cache ports) in FIG. 5. Wilson also discloses a plurality of data buses (transpose in bus, transpose out bus) connected with the plurality of cache ports. "The data input and data output lines to the cache RAMs MEM0-MEM8 are shown by arrows that indicate the input or output direction..." (column 13, lines 19-21).

With respect to claim 2, "The distributed data cache of Claim 1, further comprising a data path adapted for processing data and having at least one data input and at least one data output, wherein the data input and data output are connected with the plurality of data buses" is disclosed in column 8, lines 11-18.

The examiner interprets claim 2 as a data path, which can process data (or move data from and to), and has at least one data input and one data output that are connected to the plurality of data buses.

Wilson discloses in column 8, lines 15-18, FIG. 1 elements 5, 21, 22 "The host 21 can independently read or write data, such as image data obtained from an external



Art Unit: 2189

source (not shown), or write instructions in memories 23 through bus 22 for use by chip 5." Wilson teaches that a data path (read/write data from memory through bus) has a data input (host) and a data output (memory). Also, since the memories are connected to the Processing Chips the data bus is also connected to the plurality of buses (transpose in and transpose out buses). Furthermore, it is also inherent that a data path (or data bus) has at least one data input and at least one data output in order for signal or data to travel from one element to another. Therefore the data input and the data output are inherently connected with the plurality of data buses because they are a component of a data bus.

With respect to claim 3, "The distributed data cache of Claim 2, further comprising a multiplexer for alternately connecting the data input with each of the plurality of data buses" is disclosed in column 14, lines 64-65.

The examiner interprets this claim to mean that the distributed data cache of claim 1 comprises a multiplexer for connecting data input with each of the plurality of buses.

Wilson discloses in column 14, lines 64-65, FIG. 7, elements 71-72, "The data line 74, which is the output from multiplexer 73, and data line 59, provided as inputs to multiplexer 75..." FIGs. 5 and 7 disclose how the data is connected to the plurality of buses

With respect to claim 4, "The distributed data cache of Claim 2, further comprising a multiplexer for alternately connecting the data output with each of the plurality of data buses" is disclosed in column 14, lines 64-65.

The examiner interprets this claim to mean that the distributed data cache of claim 1 comprises a multiplexer for connecting data output with each of the plurality of buses.

Wilson discloses in column 14, lines 64-65, FIG. 7, element 75, "The data line 74, which is the output from multiplexer 73, and data line 59, provided as inputs to multiplexer 75..." FIGs. 5 and 7 disclose how the data is connected to the plurality of buses.

With respect to claim 5, "The distributed data cache of Claim 1, further comprising a plurality of data address generators connected with a memory unit and the plurality of data buses without latency" is disclosed in column 24, lines 39-46.

The examiner interprets this claim to mean the distributed data cache of Claim 1, which further comprises a plurality of data address generators connected with a memory unit and the plurality of data buses. The examiner interprets this claim sans the limitation "without latency" for reasons stated above.

Wilson discloses "The word on lines CTL12 correspond to a starting address. The output on line 103 is sent to the address inputs of all cache memories MEMS-

Art Unit: 2189

MEMS. Control lines CTL13 provides a word, which is constant for this data cycle, that is added to the output of counter 121 by adder 126, which then outputs an address for memories MEM0-MEM4" (column 24, lines 39-46).

With respect to claims 6 and 7 "The distributed data cache of Claim 5, wherein the plurality of data address generators are adapted to retrieve a plurality of data values from the memory unit and communicate the plurality of data values to the plurality of data buses directly without any latency due to registering" and "The distributed data cache of Claim 6, wherein the plurality of data address generators are adapted to simultaneously communicate the plurality of data values to the plurality of data buses, wherein each of the plurality of data values is communicated to a different one of the plurality of data buses," respectively are both disclosed in column 26, lines 26-33, FIG. 13 element 24C.

The examiner interprets claim 6 to mean the distributed data cache of claim 5, which further comprises a plurality of data address generators that are able to retrieve (or access, communicate, etc) a plurality of data values from the memory unit and communicate these plurality of data values to the plurality of data buses. The examiner interprets this claim sans the limitation "without any latency due to registering" for reasons stated supra.

The examiner interprets claim 7 to mean the distributed data cache of claim 6, wherein the plurality of address generators have the ability to simultaneously (or within

Art Unit: 2189

the same clock cycle) communicate the plurality of data values to the plurality of data buses, wherein each of the plurality of data values is communicated to a different one of the plurality of data buses.

Wilson discloses "The data is burst in sequential row order, or, in other words, a row at a time, wherein each clock pulse to external memory 23 causes the next consecutive address (e.g., the next row of data in memory 23) to be referenced, the data stored therein being sent via lines 24C to, for example, the cache memories MEM5-MEMS, or to processors 46, 47, and 48 for processing during that clock cycle" is disclosed in column 26, lines 26-33, FIG. 13 element 24C. Wilson references (communicates or retrieves) a row of data (plurality of data values) to a plurality of data buses (lines 24C of FIG. 13) simultaneously (burst and during the same clock cycle).

With respect to claim 8, "The distributed data cache of Claim 7, wherein the first cache memory unit is adapted to simultaneously load a plurality of data values from the plurality of data buses, such that each of the plurality of data values is loaded in a different one of the plurality of cache lines of the first cache memory unit through the same port" is disclosed in column 2, lines 44-48 and the abstract

The examiner interprets this claim to mean the cache memory units (MEM0-8 elements of FIG.5) can be made to simultaneously load (burst) one of the sets of data values (one of a consecutive row of a data matrix) from the plurality of data buses (Note: both Transpose In and Transpose Out Buses shown in FIG. 5 of Wilson are each

Art Unit: 2189

a plurality of buses). Additionally, the apparatus can be made to load a data value to a different one (of a plurality of) cache lines of the first cache memory unit through the same port.

Wilson discloses "The system further includes a controller for each chip that sequences a burst of consecutive rows of a data matrix from the external cache burst memory, to be stored in either the cache memory associated with each of the processing units or routed directly to the processors included in each processing unit" (abstract). Wilson also discloses in column 2, lines 44-48, "Usage of cache memory internal to the microprocessor allows instructions and data to be stored in different caches and be simultaneously addressed thereby improving the memory bandpass internally." Since data is stored in different caches, it is transferred through a plurality of buses. Also, FIG. 1 shows since different caches are addressed simultaneously, there are different cache lines through which data values are loaded in (stored).

With respect to claim 10, "The distributed data cache of Claim 1, further comprising at least one additional cache memory unit also having a plurality of cache lines, wherein each cache line of the additional cache memory unit is connected with the plurality of data buses," is disclosed in column 20, lines 54-59.

The examiner interprets this claim to mean (the distributed data cache of Claim 1) which comprises at least one additional cache memory unit that also has a plurality of cache lines, wherein each cache line of the additional cache memory unit is connected

with the plurality of buses. It is inherent that a cache memory unit has a plurality of cache lines.

Wilson discloses in column 20, lines 54-59, FIG. 5 "As shown in FIG. 5, each of the eight transpose-bus-out lines 55 are connected via a respective line 100 to a respective output selector S56 in each of the processing units 29A-29H. Control line CTL3 in only a selected one of the eight processing units 29A-29H can be activated to cause the contents of the respective cache memories MEM0-MEM7 to be transferred to transpose-bus-out 55 via selectors S10-S17." Wilson teaches in FIG. 5 that each of the cache memory units' (at least one additional cache memory unit: see elements MEM0-8) cache lines (inherent) is connected with the plurality of data buses (transpose out/in buses through element S10-17 and S20-28).

With respect to claim 12, "An apparatus for transposing a plurality of data values arranged in a matrix, the apparatus comprising: a plurality of cache memory units, each cache memory unit having a plurality of cache ports; and a plurality of data buses, each data bus connected with a different one of the plurality of cache ports from each of the cache memory or register file units." is disclosed in column 5, lines 31-33.

The examiner interprets this claim as an apparatus that can transpose a plurality of data values arranged in a matrix, with the apparatus comprising a plurality of cache memory units, each cache memory unit having multiple connections to buses or external data lines. Furthermore, the apparatus includes a plurality of data buses that

Art Unit: 2189

each connect to a different data bus connected to the cache memory (cache port).

(Note: this limitation is rejected as stated supra with respect to claim 1)

Wilson discloses in column 5, lines 31-33, "In parallel processing operations, it is often desirable to change or transpose the format of the data array stored in memory when it is read into the processing units." Wilson also discloses, "...means coupling each of said M processing units with the respectively associated column of said memory means for transferring, in said first clock cycle, each bit of said first row of M bits of matrix data from the M columns of memory means to the respectively associated one of M processing units wherein horizontally displaced data values from said memory means are presented to each of said M processing units in said first clock cycle" (column 31, lines 20-24). Wilson anticipates an apparatus for transposing a plurality of data values (data array) arranged in a matrix.

(Note: The following is in regard to claims 13, 15, and 16)

With respect to claim 13, "The apparatus of Claim 14, wherein the plurality of data address generators are adapted to sequentially communicate the plurality of sets of data values with the plurality of data buses without any register latency,"

claim 15, "The apparatus of Claim 14, wherein the plurality of data address generators are adapted to sequentially communicate the plurality of sets of data values with the plurality of data buses without any register latency,"

and claim 16, "The apparatus of Claim 15, wherein the plurality of data address

Art Unit: 2189

generators are adapted to simultaneously communicate the data values of each set of data values to the plurality of data buses without any register latency” are all disclosed in column 26, lines 21-34, FIG. 13 element 24C.

The examiner interprets claim 13 to mean (the apparatus of claim 12), which further comprises a plurality of data address generators that are able to retrieve (or access, communicate, etc) a plurality of data values from the memory unit and communicate these plurality of data values to the plurality of data buses. The examiner interprets the claim limitation “without any latency” as the amount of time it takes Wilson to move the data.

The examiner interprets claim 15 to mean the plurality of address generators have the ability to sequentially communicate the plurality of sets of data values with the plurality of data buses. The examiner interprets the claim limitation “without any register latency” for reasons stated supra.

The examiner interprets claim 16 to mean the plurality of address generators have the ability to simultaneously (or within the same clock cycle) communicate the plurality of sets of data values to the plurality of data buses.

Wilson discloses “The data is burst in sequential row order, or, in other words, a row at a time, wherein each clock pulse to external memory 23 causes the next consecutive address (e.g., the next row of data in memory 23) to be referenced, the data stored therein being sent via lines 24C to, for example, the cache memories MEM5-MEMS, or to processors 46, 47, and 48 for processing during that clock cycle” is disclosed in column 26, lines 26-33, FIG. 13 element 24C. The plurality of data address generators



Art Unit: 2189

are referenced again in column 26, lines 21-25. Wilson also discloses, "the contents of the transpose-bus-out 55 will be transferred to lines 24C that are connected to external memory 23" (column 20 lines 66-67). Lines 24C are used as a plurality of buses each leading to a different memory port.

As per claim 15, Wilson teaches that the data is burst in sequential row order, or, in other words, a row at a time (sequentially and in "data sets" or rows), and later sent via lines 24C (communicated to a plurality of buses).

As per claim 16, Wilson discloses a row of data (plurality of sets of data values) is communicated (referenced or sent) to a plurality of data buses (lines 24C of FIG. 13) simultaneously (burst and during the same clock cycle).

With respect to claim 14, "The apparatus of Claim 13, wherein the plurality of data values comprises a plurality of sets of data values" is disclosed in column 5, lines 64-66 and column 8 lines 51-53.

The examiner interprets this claim to mean a plurality of data values comprises a plurality of sets or groups of data values.

Wilson outlines a "respective row of N data bits" in column 5, lines 64-66. Wilson shows that data is grouped over a plurality of rows (set of data values). Wilson also discloses "one or more columns of array data stored in memory" in column 8, lines 51-53, which illustrate a set of data values (one or more columns of array data).

With respect to claim 17, "The apparatus of Claim 16, wherein each set of data values is a matrix row" is disclosed in column 4, lines 64-68.

The examiner interprets this claim to mean that each set of data values is a matrix row.

Wilson discloses in column 4, lines 64-68, "The apparatus comprises: a first memory means having L rows and M columns, for storing a data matrix having P columns, where P is an integer greater than M, wherein the data matrix is stored in the first memory means in a plurality of segments." Wilson outlines a "respective row of N data bits" in column 5, lines 64-66. Wilson shows that data is grouped over a plurality of rows (set of data values).

With respect to claim 18, "The apparatus of Claim 16, wherein each set of data values is a matrix column" is disclosed in column 4, lines 64-68.

The examiner interprets this claim to mean that each set of data values is a matrix column.

Wilson discloses in column 4, lines 64-68, "The apparatus comprises: a first memory means having L rows and M columns, for storing a data matrix having P columns, where P is an integer greater than M, wherein the data matrix is stored in the first memory means in a plurality of segments." Wilson discloses "one or more columns

Art Unit: 2189

of array data stored in memory” in column 8, lines 51-53, which illustrate a set of data values (one or more columns of array data).

With respect to claim 19, “The apparatus of Claim 16, wherein each of the cache memory units is adapted to simultaneously load one of the sets of data values from the plurality of data buses, such that each data value of the set of data values is loaded in a different one of the plurality of cache ports of the cache memory unit or register file” is disclosed column 2, lines 44-48 and the abstract.

The examiner interprets this claim to mean the cache memory units (MEM0-8 elements of FIG.5) can be made to simultaneously load (burst) one of the sets of data values (one of a consecutive row of a data matrix) from the plurality of data buses (Note: both Transpose In and Transpose Out Buses shown in FIG. 5 of Wilson are each a plurality of buses). Additionally, the apparatus can be made to load a data value from a set of data values to a different one of the plurality of cache memory units. As stated supra, the examiner interprets cache port to simply identify the means through which a data bus connects to a cache memory unit.

Wilson discloses “The system further includes a controller for each chip that sequences a burst of consecutive rows of a data matrix from the external cache burst memory, to be stored in either the cache memory associated with each of the processing units or routed directly to the processors included in each processing unit” (abstract). Wilson also discloses in column 2, lines 44-48, “Usage of cache memory

Art Unit: 2189

internal to the microprocessor allows instructions and data to be stored in different caches and be simultaneously addressed thereby improving the memory bandpass internally.” Since data is stored in different caches, it is transferred through a plurality of buses. Also, since different caches are addressed simultaneously, there are different cache ports through which data values are loaded in (stored).

With respect to claim 20, “A method for transposing a plurality of data values arranged in a matrix, the method comprising: retrieving a first subset of data values from the plurality of data values from a memory unit; simultaneously transferring the first subset of data values to a plurality of data buses, wherein each data value of the first subset is transferred to a different one of the plurality of data buses; and simultaneously loading the first subset of data values from the plurality of data buses to a first cache memory unit having a plurality of cache lines, wherein each cache port receives a data value from a different one of the plurality of data buses without any latency” is disclosed in column 15, lines 18-20, as well as the abstract.

Wilson discloses in column 15, lines 18-20, “...the four cache memories MEM5-MEM8 are capable of storing arbitrary segments of matrix data retrieved from external memory 23.” Wilson teaches retrieving a first subset of data values from the plurality of data values (arbitrary segments of matrix data) from a memory unit (external memory).

Wilson next discloses in the abstract “The system further includes a controller for each chip that sequences a burst of consecutive rows of a data matrix from the external

Art Unit: 2189

cache burst memory, to be stored in either the cache memory associated with each of the processing units or routed directly to the processors included in each processing unit.” In this disclosure, Wilson teaches the simultaneous transfer of the first subset of data values (burst of consecutive rows of a data matrix) to a plurality of data buses (routed directly to the processors included in each processing unit). Since there is a different data bus connected to the plurality of processing units (see FIG. 1) the plurality of data values are each transferred to a different one of the plurality of buses (that lead to the different processing units).

Wilson also teaches simultaneously loading the first subset of data values from the plurality of data buses to a first cache memory unit (...to be stored in either the cache memory associated with each of the processing units). The examiner interprets loading to mean stored. It is inherent for a cache memory unit to have a plurality of cache lines when there are pluralities of data values stored within the cache. FIG. 5 shows each cache port (see cache memory units MEM0-8) receiving data from a different one of the plurality of data buses (shown in Transpose In Bus connecting to the cache memory units through S10-17).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2189

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere CO.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Wilson (U.S. Patent no. 5,557,734) in view of Okuda et. al (US Patent No. 6,535,452 hereafter referred to as Okuda).

With respect to claim 9, Wilson teaches "The distributed data cache of Claim 1..." as stated supra.

Wilson, however, does not disclose expressly "...wherein the number of cache lines of the first cache memory unit are equal to the number of data buses."

Okuda discloses, "...respective blocks of the memory blocks corresponding to the m respective data pins, and are simultaneously activated, the activation of any one of the address selection lines connecting the data bus lines to a corresponding one of the m respective blocks and resulting in the n data pieces being input/output to/from the

Art Unit: 2189

corresponding one of the m respective blocks" (Okuda abstract). The examiner interprets cache lines as memory blocks corresponding to respective data pins.

Wilson and Okuda are analogous art because they are from the same field of endeavor, that being cache or memory data distribution.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate a distributed data cache of claim 1 in which the number of cache lines or memory blocks of the cache memory unit is equal to the number of data buses outlined above to arrive at claim 9.

The motivation for doing so would have been obvious based on the enhancement of speed of memory access, which is disclosed in column 1, lines 32-42, which recites, "For the purpose of speeding up the operation speed of semiconductor memory devices, generally, the operation of core circuits inside the memory devices need to be made faster. It is difficult, however, to speed up the operation of core circuits because of limitations such as wire delays. When a fixed number of data bits are to be serially input/output upon a single access, provision may be made not only to read data corresponding to the plurality of DQ pins in parallel from the memory core, but also to read serially output data in parallel from the memory core."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Wilson and Okuda before him/her to combine Okuda with Wilson for the benefit of having the number of cache lines equal to the number of data buses to obtain the invention as specified in claim 9.

Claim 11 is rejected under 35 U.S.C. 103(a) as being obvious over Wilson (U.S. Patent no. 5,557,734) with "Computer Organization and Design" 2<sup>nd</sup> edition, by Hennessy and Patterson offered as extrinsic evidence (hereafter referred to as Hennessy).

With respect to claim 11, Wilson teaches "The distributed data cache of Claim 10..." as stated supra.

Wilson, however, does not disclose expressly "...wherein the total number of cache memory units is equal to the number of cache lines in each cache memory unit."

Hennessy discloses, "In a set-associative cache, there are a fixed number of locations (at least two) where each block can be placed; a set-associative cache with n locations for a block is called an n-way set-associative cache. An n-way set-associative cache consists of a number of sets, each of which consists of n blocks..."(page 569).

Blocks in this definition is analogous to cache line.

Wilson and Hennessy are analogous art because they are from the same field of endeavor, that being ordering or controlling memory commands.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to design a distributed data cache which has an N-way, M-line set associative cache design implementation wherein N is equal to M outlined above to arrive at claim 11. Each cache way is treated like a small direct mapped cache. The examiner interprets figures 6 and 7 to teach an implementation of a direct-mapped cache.



The motivation for doing so would have been obvious based on Hennessy, page 570, "The advantage of increasing the degree of associativity is that it usually decreases the miss rate..."

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Wilson and Hennessy before him/her to combine Hennessy with Wilson for the benefit of having a M-way, M-set associative distributed data cache to obtain the invention as specified in claim 11.

### ***Conclusion***

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Horace L. Flournoy whose telephone number is (571) 272-2705. The examiner can normally be reached on Monday-Friday 7:00 AM to 4:30 PM (ET).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Sparks can be reached on (571) 272-4201. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 746-7239

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Art Unit: 2189

questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2100.

Horace L. Flournoy



Patent Examiner

Art unit: 2189



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